GR-01 GIMBAL RETRACT USER GUIDE V1.0

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INTRODUCTION

The GR-01 gimbal retract mechanism is specifically designed for OTUS U135 gyro-stabilized gimbals from DST CONTROL AB (www.dst.se). GR-01 is not compatible with other gimbal systems- please contact UAV Factory for custom gimbal retraction mechanism configurations.

The gimbal retract design is optimized for high accelerations that are present during aircraft catapult takeoff, belly or parachute landing. The gimbal retract is capable of withstanding over 20 g vertical acceleration in stowed configuration.

The flexible control options allow simple retract mechanism integration with any unmanned aircraft autopilot system. Gimbal retract can be also operated by switch circuit for manned operations or lab testing purposes.

Unit can be optionally equipped with air-damped isolators for best vibration isolation performance.

KEY FEATURES

- Lightweight design
- Low profile geometry
- Air-damped vibration isolators
- Durable and simple design
- Fast retraction
- Over-current protection

SPECIFICATIONS

Input Voltage	10 - 14 V
Power consumption	7W during actuation, 0.6W when deployed/retracted
Weight	< 450 grams
Retraction time	< 1 second
Control method	CAN/PWM/ discrete input
Safety features	Over-current protection Up/down position status indication

DIMENSIONS

GR-01 has very low mounting profile and small volume, which makes it possible to install into limited space such as unmanned aircraft vehicle's fuselage. Drawings in deployed and retracted positions are shown in Figure 1.

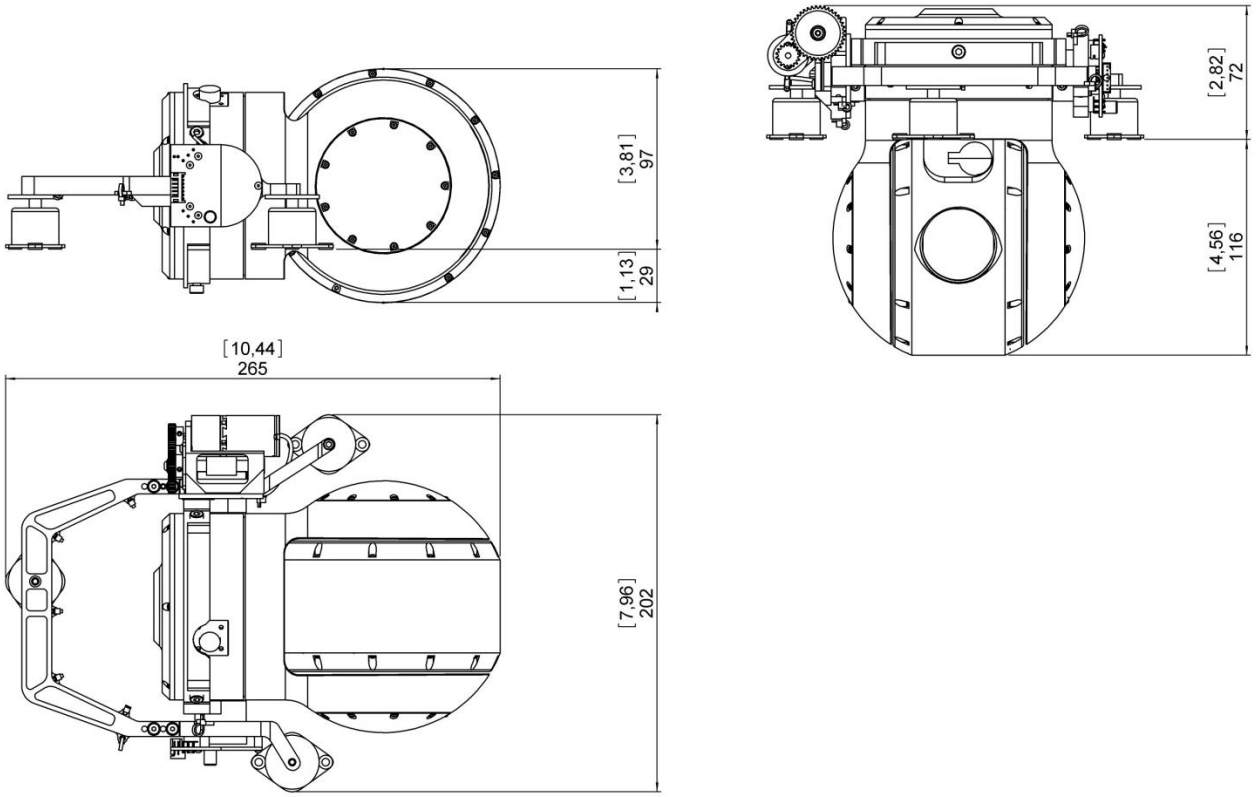

Figure 1 GR-01 dimensions in deployed and retracted states.

MOUNTING

GR-01 is mounted on three vibration isolators, equally spaced from the center of mass for better vibration isolation. Position of vibration isolators and mounting holes are given in Figure 2.

The U-135 gimbal is fastened to the retraction mechanism using three M4x 16mm machine screws (Figure 3). It is recommended to apply soft thread locker on the mounting screws.

Before inserting the gimbal base into the retraction mechanism, it is necessary to apply electrical tape to the base of the gimbal (shown in Figure 4). Electrical tape is necessary to produce a tight fit between the mounting ring and the base.

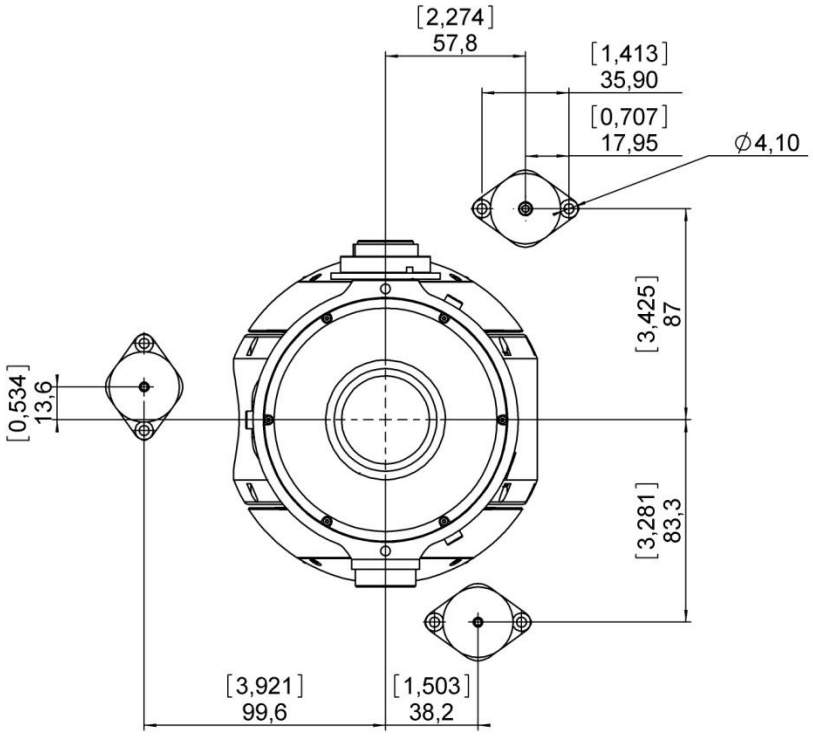

Figure 2 Mounting hole dimensions

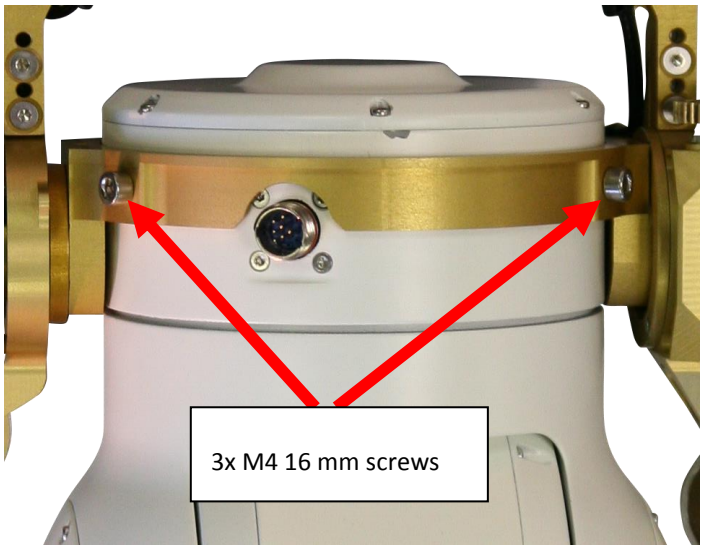

Figure 3 U-135 gimbal and retraction mechanism interface

Figure 4 Applying electrical tape to the base of the U-135 gimbal

WIRING

All connections to the gimbal retract are done through J1 connector located on electronics PCB as shown in Figure 5. The J1 connector pinout is given in Figure 6 with descriptions given in Table 1

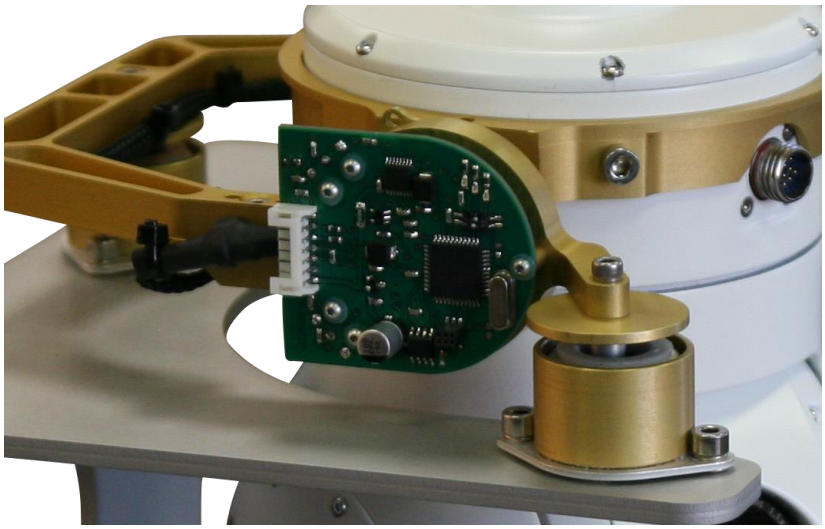

Figure 5 Electronics PCB

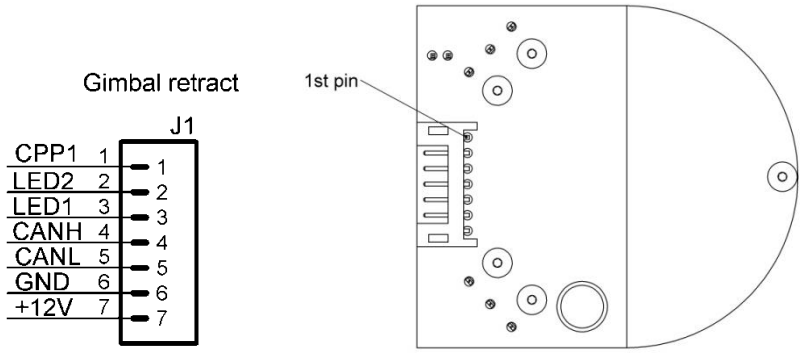

Figure 6 J1 connector pinout

Table 1 GR-01 J1 pin descriptions

Pin	Name	Level	Function
1	CCP1	TTL input	Servo PWM/Digital input with internal 10 kOhm pull-up, with automatic source selection
2	LED2	+5V	High when gimbal in deployed position , with built-in 330 Ohm resistor for direct indication led connection
3	LED1	+5V	High when gimbal in retracted position, with built-in 330 Ohm resistor for direct indication led connection
4	CAN_H	CAN High	CAN communication
5	CAN_L	CAN Low	CAN communication
6	GND	0V	Common ground
7	Power	+12V	Power supply 10 - 14 VDC

QUICK SETUP KIT

For quick laboratory setup, UAV Factory offers simple hand controller and gimbal stand. Hand controller is schematically shown in Figure 7. First, connect the controller cable to the J1 connector on the gimbal retraction mechanism. Apply 10 - 14 VDC power source to the hand controller. Use retraction switch to deploy or retract the GR-01 retraction mechanism. The connected hand controller is shown in Figure 8

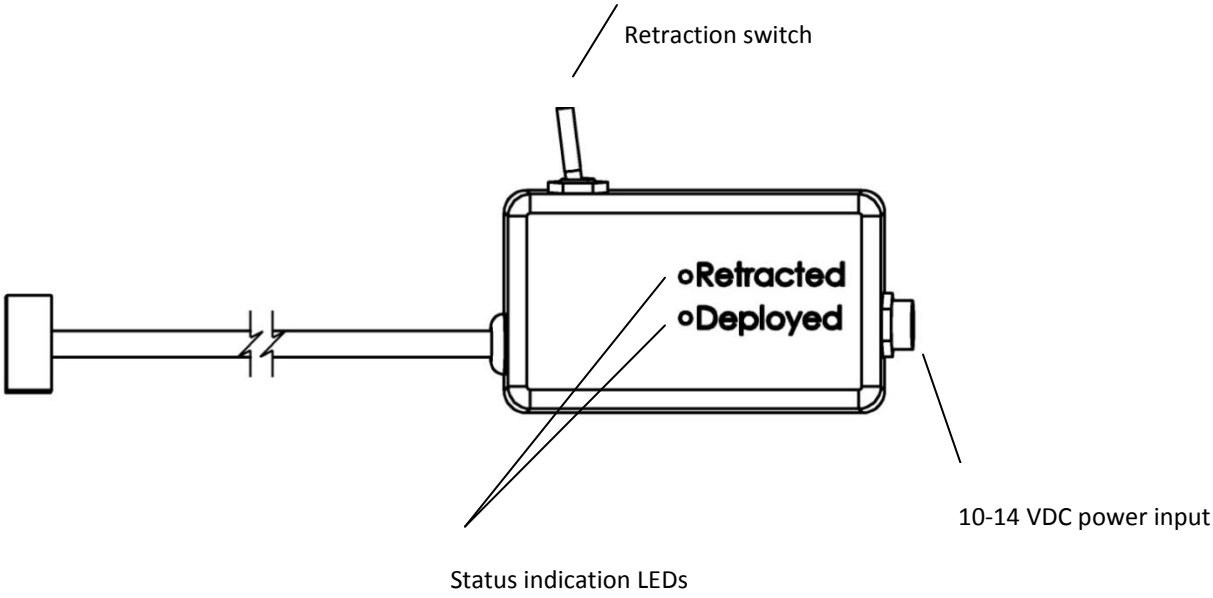

Figure 7 GR-01 hand controller

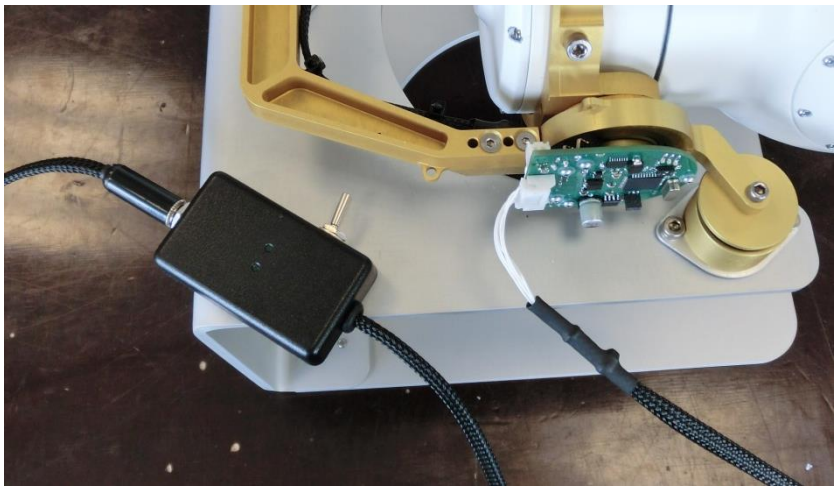

Figure 8 hand controller connected to retraction mechanism

The Otus U-135 gimbal and retraction mechanism assembly can be conveniently mounted on aluminum stand which is supplied with the Quick Setup Kit. The stand offers simple access to retract mechanism and U-135 gimbal's electrical connections.

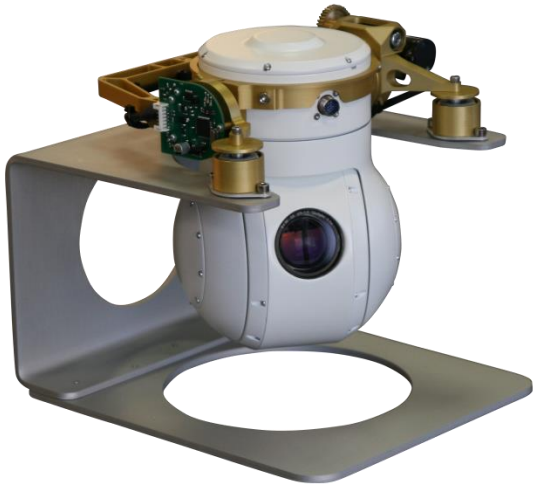

Figure 9 Retraction mechanism with U-135 gimbal on aluminum stand

OPERATION

Three possible control methods can be used for gimbal retraction mechanism operation:

- CAN
- PWM
- Discrete input

GR-01 automatically recognizes input signal. Status indication can be seen through CAN messages or indication LEDs located on GR-01 electronics PCB.

PWM CONTROL

The GR-01 can be operated with servo PWM signal input. This control method can be quickly implemented with most autopilot system. Wiring diagram for connecting GR-01 is given in Figure 10. Signal can be given by autopilot PWM output. If control signal is lost, GR-01 will be commanded to retract. Commanding PWM signal width is given in Table 2.

Table 2 PWM control commands

Function	Pulse width, µs
Deploy	900 – 1450
Retract	1550 – 2100

The indication led can be connected directly to GR-01 because of the built in internal 330 Ohm resistors to reduce external components and facilitate setup. Indication LED description is given in Table 3.

Table 3 GR-01 status indication led

Status	LED 1	LED 2
Retracted	ON	OFF
Deployed	OFF	ON
Undefined	OFF	OFF

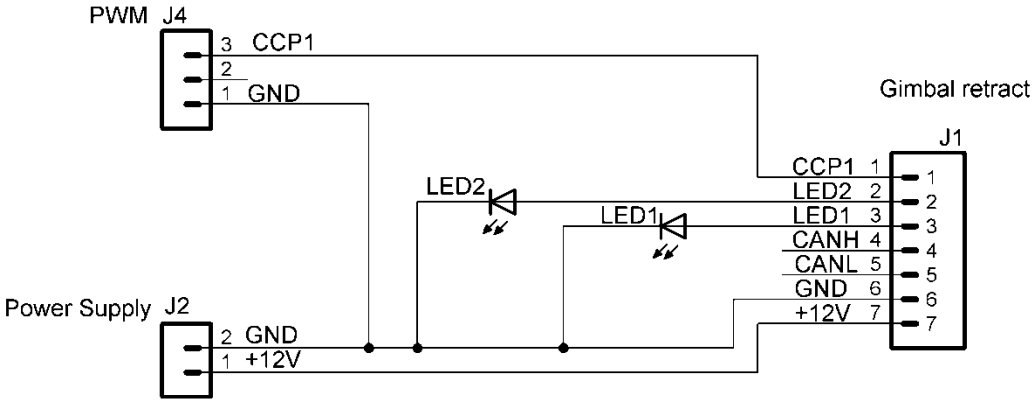

Figure 10 Recommended wiring diagram for PWM control

DISCRETE INPUT CONTROL

GR-01 allows controlling its position by using a simple switch or discrete microcontroller/autopilot signal. Signal level description given in Table 4. Control pin has built 10 kOhm pull-up resistor to reduce external components. By default GR-01 is commanded to retract gimbal and if loss of signal occurs, gimbal will be retracted. Wiring diagram is given in Figure 11. Discrete control function uses 5V logic.

Table 4 Discrete input commands on CCP1

Function	Input level
Retract	High
Deploy	Low

The indication led can be connected directly to GR-01 because of the built in 330 Ohm resistors. Indication LED description is given in Table 5.

Table 5 GR-01 status indication led

Status	LED 1	LED 2
Retracted	ON	OFF
Deployed	OFF	ON
Undefined	OFF	OFF

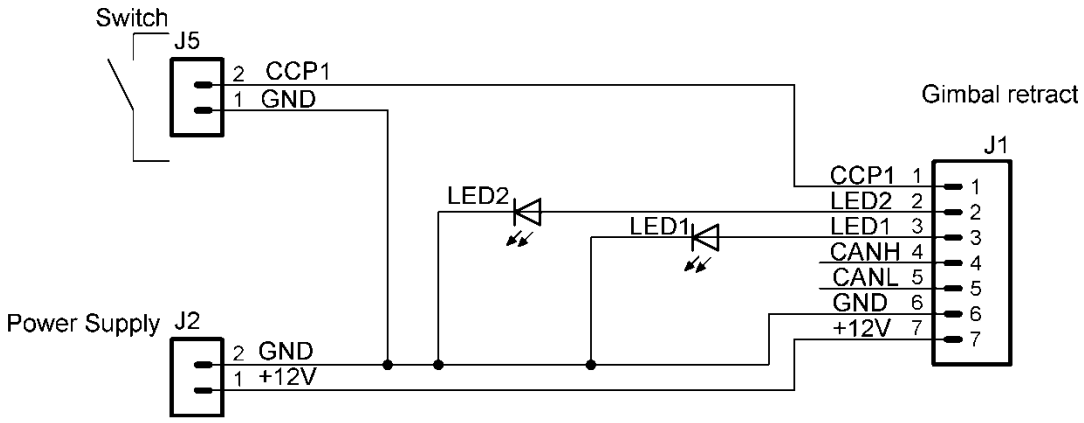

Figure 11 Recommended wiring diagram for discrete input control

CAN CONTROL

The GR-01 uses version 2.0B of the CAN protocol at 1Mbaud. This version specifies extended 29bit identifier for each CAN frame. Recommended wiring diagram is shown in Figure 12. GR-01 has built in 120 Ohm CAN line terminating resistor. The following CAN messages (Table 6) are used to command retract/deploy. No parameters are used. It may be a zero length message.

Table 6 GR-01 CAN command messages

Function	CAN Message HEX ID	Data length
Retract	0x1203xxxx	any (0-8) bytes
Deploy	0x1202xxxx	any (0-8) bytes

GR-01 generates status message sent at 10 Hz rate. Message HEX ID: 0x12010001, data length: 8 bytes. Description of CAN status message is given in Table 7.

Table 7 GR-01 CAN status message

Byte	Value	Name
0		Detected stop, uint8
	0	NOT_DETECTED
	1	FULLY_DEPLOYED
	2	FULLY_RETRACTED
	3	ERROR_DETECTED
1		Motor direction, uint8
	0	OFF
	1	DEPLOYING
	2	RETRACTING
2	-	Reserved
3	-	Reserved
4	uint16	Motor current, uint16, LSByte, milliamps
5	uint16	Motor current, uint16, MSByte, milliamps
6	-	Reserved
7	uint8	Message counter, uint8

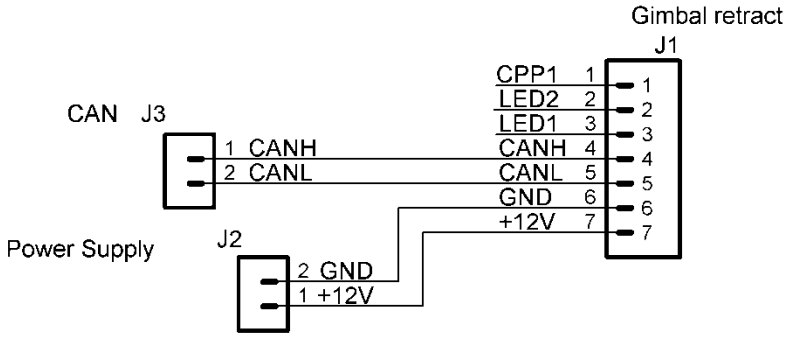

Figure 12 Recommended wiring diagram for CAN control

VERSION HISTORY

Version	Comments, Updates	Date	Author
1.0	Initial release of GR-01 user manual	25.03.2013	GM